General

Guideline Title

MI - secondary prevention. Secondary prevention in primary and secondary care for patients following a myocardial infarction.

Bibliographic Source(s)

National Clinical Guideline Centre. MI â€“ secondary prevention. Secondary prevention in primary and secondary care for patients following a myocardial infarction. London (UK): National Institute for Health and Care Excellence (NICE); 2013 Nov. 40 p. (Clinical guideline; no. 172).

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: National Collaborating Centre for Primary Care. Post myocardial infarction: secondary prevention in primary and secondary care for patients following a myocardial infarction. London (UK): Royal College of General Practitioners; 2007 May. 231 p.

Recommendations

Major Recommendations

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance.

See the original guideline document for the definitions of terms used in the guideline.

Recommendations are marked as [new 2013], [2013], [2007] or [2007, amended 2013]

- [new 2013] indicates that the evidence has been reviewed and the recommendation has been added or updated
- [2013] indicates that the evidence has been reviewed but no change has been made to the recommended action
- [2007] indicates that the evidence has not been reviewed since 2007
- [2007, amended 2013] indicates that the evidence has not been reviewed since 2007, but changes have been made to the recommendation wording that change the meaning.

Cardiac Rehabilitation after an Acute Myocardial Infarction (MI)

Comprehensive Cardiac Rehabilitation

All patients (regardless of their age) should be given advice about and offered a cardiac rehabilitation programme with an exercise component. [2007]

Cardiac rehabilitation programmes should provide a range of options, and patients should be encouraged to attend all those appropriate to their clinical needs. Patients should not be excluded from the entire programme if they choose not to attend certain components. [2007]

If a patient has cardiac or other clinical conditions that may worsen during exercise, these should be treated if possible before the patient is offered the exercise component of cardiac rehabilitation. For some patients, the exercise component may be adapted by an appropriately qualified healthcare professional. [2007]

Patients with left ventricular dysfunction who are stable can safely be offered the exercise component of cardiac rehabilitation. [2007]

Encouraging People to Attend

Deliver cardiac rehabilitation in a non-judgemental, respectful, and culturally sensitive manner. Consider employing bilingual peer educators or cardiac rehabilitation assistants who reflect the diversity of the local population. [new 2013]

Establish people's health beliefs and their specific illness perceptions before offering appropriate lifestyle advice and to encourage attendance to a cardiac rehabilitation programme. [new 2013]

Offer cardiac rehabilitation programmes designed to motivate people to attend and complete the programme. Explain the benefits of attending. [new 2013]

Discuss with the person any factors that might stop them attending a cardiac rehabilitation programme, such as transport difficulties. [new 2013]

Offer cardiac rehabilitation programmes in a choice of venues (including at the person's home, in hospital, and in the community) and at a choice of times of day, for example, sessions outside of working hours. Explain the options available. [new 2013]

Provide a range of different types of exercise, as part of the cardiac rehabilitation programme, to meet the needs of people of all ages, or those with significant comorbidity. Do not exclude people from the whole programme if they choose not to attend specific components. [new 2013]

Offer single-sex cardiac rehabilitation programme classes if there is sufficient demand. [new 2013]

Enrol people who have had an MI in a system of structured care, ensuring that there are clear lines of responsibility for arranging the early initiation of cardiac rehabilitation. [new 2013]

Begin cardiac rehabilitation as soon as possible after admission and before discharge from hospital. Invite the person to a cardiac rehabilitation session which should start within 10 days of their discharge from hospital. [new 2013]

Contact people who do not start or do not continue to attend the cardiac rehabilitation programme with a further reminder, such as:

- A motivational letter
- A prearranged visit from a member of the cardiac rehabilitation team
- A telephone call
- A combination of the above [new 2013]

Seek feedback from cardiac rehabilitation programme users and aim to use this feedback to increase the number of people starting and attending the programme. [new 2013]

Be aware of the wider health and social care needs of a person who has had an MI. Offer information and sources of help on:

- Economic issues
- Welfare rights
- Housing and social support issues [new 2013]

Make cardiac rehabilitation equally accessible and relevant to all people after an MI, particularly people from groups that are less likely to access this service. These include people from black and minority ethnic groups, older people, people from lower socioeconomic groups, women, people from rural communities, people with a learning disability, and people with mental and physical health conditions. [2007, amended 2013]

Encourage all staff, including senior medical staff, involved in providing care for people after an MI, to actively promote cardiac rehabilitation. [2013]

Health Education and Information Needs

Comprehensive cardiac rehabilitation programmes should include health education and stress management components. [2007]

A home-based programme validated for patients who have had an MI (such as The Heart Manual) that incorporates education, exercise, and stress management components with follow-ups by a trained facilitator may be used to provide comprehensive cardiac rehabilitation. [2007]

Take into account the physical and psychological status of the patient, the nature of their work and their work environment when giving advice on returning to work. [2007]

Be up to date with the latest Driver and Vehicle Licensing Agency (DVLA) guidelines. Regular updates are published on the DVLA website . [2007]

After an MI without complications, people who wish to travel by air should seek advice from the Civil Aviation Authority . People who have had a complicated MI need expert individual advice. [2007, amended 2013]

People who have had an MI who hold a pilot's licence should seek advice from the Civil Aviation Authority . [2007]

Take into account the patient's physical and psychological status, as well as the type of activity planned when offering advice about the timing of returning to normal activities. [2007]

An estimate of the physical demand of a particular activity, and a comparison between activities, can be made using tables of metabolic equivalents (METS) of different activities (for further information please refer to the Centers for Disease Control and Prevention website). Advise patients how to use a perceived exertion scale to help monitor physiological demand. Patients who have had a complicated MI may need expert advice. [2007]

Advice on competitive sport may need expert assessment of function and risk, and is dependent on what sport is being discussed and the level of competitiveness. [2007]

Psychological and Social Support

Offer stress management in the context of comprehensive cardiac rehabilitation. [2007]

Do not routinely offer complex psychological interventions such as cognitive behavioural therapy. [2007]

Involve partners or carers in the cardiac rehabilitation programme if the patient wishes. [2007]

For recommendations on the management of patients with clinical anxiety or depression, see the following NICE clinical guidelines: Generalised anxiety disorder and panic disorder (with or without agoraphobia) in adults. Management in primary, secondary and community care (NICE clinical guideline 113), Depression. The treatment and management of depression in adults (NICE clinical guideline 90), and Depression in adults with a chronic physical health problem. Treatment and management (NICE clinical guideline 91). [2007]

Sexual Activity

Reassure patients that after recovery from an MI, sexual activity presents no greater risk of triggering a subsequent MI than if they had never had an MI. [2007]

Advise patients who have made an uncomplicated recovery after their MI that they can resume sexual activity when they feel comfortable to do so, usually after about 4 weeks. [2007]

Raise the subject of sexual activity with patients within the context of cardiac rehabilitation and aftercare. [2007]

When treating erectile dysfunction, treatment with a phosphodiesterase type 5 (PDE5) inhibitor may be considered in men who have had an MI more than 6 months earlier and who are now stable. [2007]

PDE5 inhibitors must be avoided in patients treated with nitrates or nicorandil because this can lead to dangerously low blood pressure. [2007]

Lifestyle Changes after an MI

Changing Diet

Advise people to eat a Mediterranean-style diet (more bread, fruit, vegetables, and fish; less meat; and replace butter and cheese with products

based on plant oils). [2007]

Do not routinely recommend eating oily fish for the sole purpose of preventing another MI. If people after an MI choose to consume oily fish, be aware that there is no evidence of harm, and fish may form part of a Mediterranean-style diet. [new 2013]

Do not offer or advise people to use the following to prevent another MI:

- Omega-3 fatty acid capsules
- Omega-3 fatty acid supplemented foods

If people choose to take omega-3 fatty acid capsules or eat omega-3 fatty acid supplemented foods, be aware that there is no evidence of harm. [new 2013]

Advise people not to take supplements containing beta-carotene. Do not recommend antioxidant supplements (vitamin E and/or C) or folic acid to reduce cardiovascular risk. [2007]

Offer people an individual consultation to discuss diet, including their current eating habits, and advice on improving their diet. [2007]

Give people consistent dietary advice tailored to their needs. [2007]

Give people healthy eating advice that can be extended to the whole family. [2007]

Alcohol Consumption

Advise people who drink alcohol to keep weekly consumption within safe limits (no more than 21 units of alcohol per week for men, or 14 units per week for women) and to avoid binge drinking (more than 3 alcoholic drinks in 1–2 hours). [2007]

Regular Physical Activity

Advise people to undertake regular physical activity sufficient to increase exercise capacity. [2007]

Advise people to be physically active for 20 to 30 minutes a day to the point of slight breathlessness. Advise people who are not active to this level to increase their activity in a gradual, step-by-step way, aiming to increase their exercise capacity. They should start at a level that is comfortable, and increase the duration and intensity of activity as they gain fitness. [2007]

Advice on physical activity should involve a discussion about current and past activity levels and preferences. The benefit of exercise may be enhanced by tailored advice from a suitably qualified professional. [2007]

Smoking Cessation

Advise all people who smoke to stop and offer assistance from a smoking cessation service in line with the NICE guideline Brief interventions and referral for smoking cessation (NICE public health guidance 1). [2007]

All patients who smoke and who have expressed a desire to quit should be offered support and advice, and referral to an intensive support service (for example, the National Health Service Stop Smoking Services) in line with the NICE guideline Brief interventions and referral for smoking cessation (NICE public health guidance 1). If a patient is unable or unwilling to accept a referral they should be offered pharmacotherapy in line with the recommendations in the NICE guideline Smoking cessation services (NICE public health guidance 10). [2007]

Weight Management

After an MI, offer all patients who are overweight or obese advice and support to achieve and maintain a healthy weight in line with the NICE guideline Obesity: guidance on the prevention, identification, assessment and management of overweight and obesity in adults and children (NICE clinical guideline 43). [2007]

Drug Therapy

Offer all people who have had an acute MI treatment with the following drugs:

- Angiotensin-converting enzyme (ACE) inhibitor
- Dual antiplatelet therapy (aspirin plus a second antiplatelet agent)
- Beta-blocker

- Statin [2007, amended 2013]

Ensure that a clear management plan is available to the person who has had an MI and is also sent to the general practitioner, including:

- Details and timing of any further drug titration
- Monitoring of blood pressure
- Monitoring of renal function [new 2013]

Offer all people who have had an MI an assessment of bleeding risk at their follow-up appointment. [new 2013]

Offer an assessment of left ventricular function to all people who have had an MI. [2013]

ACE Inhibitors

Offer people who present acutely with an MI an ACE inhibitor as soon as they are haemodynamically stable. Continue the ACE inhibitor indefinitely. [new 2013]

Titrate the ACE inhibitor dose upwards at short intervals (for example, every 12–24 hours) before the person leaves hospital, until the maximum tolerated or target dose is reached. If it is not possible to complete the titration during this time, it should be completed within 4–6 weeks of hospital discharge. [new 2013]

Do not offer combined treatment with an ACE inhibitor and an angiotensin II receptor blocker (ARB) to people after an MI, unless there are other reasons to use this combination. [new 2013]

Offer people after an MI who are intolerant to ACE inhibitors an ARB instead of an ACE inhibitor. [new 2013]

Renal function, serum electrolytes, and blood pressure should be measured before starting an ACE inhibitor or ARB and again within 1 or 2 weeks of starting treatment. Patients should be monitored as appropriate as the dose is titrated upwards, until the maximum tolerated or target dose is reached, and then at least annually. More frequent monitoring may be needed in patients who are at increased risk of deterioration in renal function. Patients with chronic heart failure should be monitored in line with the NICE guideline Chronic heart failure. Management of chronic heart failure in adults in primary and secondary care (NICE clinical guideline 108). [2007]

Offer an ACE inhibitor to people who have had an MI more than 12 months ago. Titrate to the maximum tolerated or target dose (over a 4–6-week period) and continue indefinitely. [new 2013]

Offer people who have had an MI more than 12 months ago and who are intolerant to ACE inhibitors an ARB instead of an ACE inhibitor. [new 2013]

Antiplatelet Therapy

Offer aspirin to all people after an MI and continue it indefinitely, unless they are aspirin intolerant or have an indication for anticoagulation. [2007, amended 2013]

Offer aspirin to people who have had an MI more than 12 months ago and continue it indefinitely. [new 2013]

For patients with aspirin hypersensitivity, clopidogrel monotherapy should be considered as an alternative treatment. [2007]

People with a history of dyspepsia should be considered for treatment in line with the NICE guideline Dyspepsia: Management of dyspepsia in adults in primary care [NICE clinical guideline 17]. [2007, amended 2013]

After appropriate treatment, people with a history of aspirin-induced ulcer bleeding whose ulcers have healed and who are negative for *Helicobacter pylori* should be considered for treatment in line with the NICE guideline Dyspepsia: Management of dyspepsia in adults in primary care [NICE clinical guideline 17] [2007, amended 2013]

This guidance incorporates NICE technology appraisal guidance 236 on ticagrelor for the treatment of acute coronary syndromes. Guidance on prasugrel for the treatment of acute coronary syndromes has not been incorporated in this guidance because this technology appraisal is currently scheduled for update. For further information about this appraisal, see the NICE website.

Ticagrelor in combination with low-dose aspirin is recommended for up to 12 months as a treatment option in adults with acute coronary syndromes (ACS) that is, people:

- With ST-segment-elevation myocardial infarction (STEMI) – defined as ST elevation or new left bundle branch block on electrocardiogram

– that cardiologists intend to treat with primary percutaneous coronary intervention (PCI) or
- With non-ST-segment-elevation myocardial infarction (NSTEMI)

This recommendation is from the NICE guideline Ticagrelor for the treatment of acute coronary syndromes (NICE technology appraisal guidance 236). [new 2013]

Offer clopidogrel as a treatment option for up to 12 months to:

- People who have had an NSTEMI, regardless of treatment*
- People who have had a STEMI and received a bare-metal or drug-eluting stent [new 2013]

*This recommendation updates and replaces recommendation 1.3 in the NICE guideline Clopidogrel in the treatment of non-ST-segment-elevation acute coronary syndrome (NICE technology appraisal guidance 80).

Offer clopidogrel as a treatment option for at least 1 month and consider continuing for up to 12 months to:

- People who have had a STEMI and medical management with or without reperfusion treatment with a fibrinolytic agent [new 2013]

Continue the second antiplatelet agent for up to 12 months in people who have had a STEMI and who received coronary artery bypass graft (CABG) surgery. [new 2013]

Offer clopidogrel instead of aspirin to people who also have other clinical vascular disease in line with the NICE guideline Clopidogrel and modified-release dipyridamole for the prevention of occlusive vascular events (NICE technology appraisal guidance 210), and who have:

- Had an MI and stopped dual antiplatelet therapy or
- Had an MI more than 12 months ago [new 2013]

Antiplatelet Therapy in People with an Indication for Anticoagulation

Take into account all of the following when thinking about treatment for people who have had an MI and who have an indication for anticoagulation:

- Bleeding risk
- Thromboembolic risk
- Cardiovascular risk [new 2013]

Unless there is a high risk of bleeding, continue anticoagulation and add aspirin to treatment in people who have had an MI who otherwise need anticoagulation and who:

- Have had their condition managed medically or
- Have undergone balloon angioplasty or
- Have undergone CABG surgery [new 2013]

Continue anticoagulation and add clopidogrel to treatment in people who have had an MI, who have undergone PCI with bare-metal or drug-eluting stents and who otherwise need anticoagulation. [new 2013]

Offer clopidogrel with warfarin to people with a sensitivity to aspirin who otherwise need anticoagulation and aspirin and who have had an MI. [new 2013]

Do not routinely offer warfarin in combination with prasugrel or ticagrelor to people who need anticoagulation who have had an MI. [new 2013]

After 12 months since the MI, continue anticoagulation and take into consideration the need for ongoing antiplatelet therapy, taking into account all of the following:

- The indication for anticoagulation
- Thromboembolic risk
- Bleeding risk
- Cardiovascular risk
- The person's wishes [new 2013]

Do not add a new oral anticoagulant (rivaroxaban, apixaban, or dabigatran) in combination with dual antiplatelet therapy in people who otherwise need anticoagulation who have had an MI. [new 2013]

Consider using warfarin and discontinuing treatment with a new oral anticoagulant (rivaroxaban, apixaban, or dabigatran) in people who otherwise need anticoagulation and who have had an MI, unless there is a specific clinical indication to continue it. [new 2013]

Beta-Blockers

Offer people a beta-blocker as soon as possible after an MI, when the person is haemodynamically stable. [new 2013]

Communicate plans for titrating beta-blockers up to the maximum tolerated or target dose – for example, in the discharge summary. [new 2013]

Continue a beta-blocker for at least 12 months after an MI in people without left ventricular systolic dysfunction or heart failure. [new 2013]

Continue a beta-blocker indefinitely in people with left ventricular systolic dysfunction. [new 2013]

Offer all people who have had an MI more than 12 months ago, who have left ventricular systolic dysfunction, a beta-blocker whether or not they have symptoms. For people with heart failure plus left ventricular dysfunction, manage the condition in line with the NICE guideline Chronic heart failure. Management of chronic heart failure in adults in primary and secondary care (NICE clinical guideline 108). [new 2013]

Do not offer people without left ventricular systolic dysfunction or heart failure, who have had an MI more than 12 months ago, treatment with a beta-blocker unless there is an additional clinical indication for a beta-blocker. [new 2013]

Calcium Channel Blockers

Do not routinely offer calcium channel blockers to reduce cardiovascular risk after an MI. [2007]

If beta-blockers are contraindicated or need to be discontinued, diltiazem or verapamil may be considered for secondary prevention in patients without pulmonary congestion or left ventricular systolic dysfunction. [2007]

For patients who are stable after an MI, calcium channel blockers may be used to treat hypertension and/or angina. For patients with heart failure, use amlodipine, and avoid verapamil, diltiazem, and short-acting dihydropyridine agents in line with the NICE guideline Chronic heart failure. Management of chronic heart failure in adults in primary and secondary care (NICE clinical guideline 108). [2007]

Potassium Channel Activators

Do not offer nicorandil to reduce cardiovascular risk in patients after an MI. [2007]

Aldosterone Antagonists in Patients with Heart Failure and Left Ventricular Dysfunction

For patients who have had an acute MI and who have symptoms and/or signs of heart failure and left ventricular systolic dysfunction, initiate treatment with an aldosterone antagonist licensed for post-MI treatment within 3 to 14 days of the MI, preferably after ACE inhibitor therapy. [2007]

Patients who have recently had an acute MI and have clinical heart failure and left ventricular systolic dysfunction, but who are already being treated with an aldosterone antagonist for a concomitant condition (for example, chronic heart failure), should continue with the aldosterone antagonist or an alternative, licensed for early post-MI treatment. [2007]

For patients who have had a proven MI in the past and heart failure due to left ventricular systolic dysfunction, treatment with an aldosterone antagonist should be in line with the NICE guideline Chronic heart failure. Management of chronic heart failure in adults in primary and secondary care (NICE clinical guideline 108). [2007]

Monitor renal function and serum potassium before and during treatment with an aldosterone antagonist. If hyperkalaemia is a problem, halve the dose of the aldosterone antagonist or stop the drug. [2007]

Statins and Other Lipid Lowering Agents

Statin therapy is recommended for adults with clinical evidence of cardiovascular disease in line with the NICE guidelines Statins for the prevention of cardiovascular events (NICE technology appraisal guidance 94) and Lipid modification. Cardiovascular risk assessment and the modification of blood lipids for the primary and secondary prevention of cardiovascular disease (NICE clinical guideline 67). [2007]

Recommendations about statins and other lipid lowering agents have been removed from the update of the guideline. Recommendations on the use of statins and other lipid lowering agents can be found in NICE guidelines Lipid modification. Cardiovascular risk assessment and the modification

of blood lipids for the primary and secondary prevention of cardiovascular disease (NICE clinical guideline 67) and Statins for the prevention of cardiovascular events (NICE technology appraisal guidance 94).

Coronary Revascularisation after an MI

Offer everyone who has had an MI a cardiological assessment to consider whether coronary revascularisation is appropriate. This should take into account comorbidity. [2007]

Selected Patient Subgroups

Patients with Hypertension

Treat hypertension in line with the NICE guideline Hypertension. Clinical management of primary hypertension in adults (NICE clinical guideline 127). [2007, amended 2013]

Patients with Left Ventricular Systolic Dysfunction

Patients who have left ventricular systolic dysfunction should be considered for an implantable cardioverter defibrillator in line with NICE guideline Implantable cardioverter defibrillators for arrhythmias (NICE technology appraisal guidance 95]. [2007]

Communication of Diagnosis and Advice

After an acute MI, ensure that the following are part of every discharge summary:

- Confirmation of the diagnosis of acute MI
- Results of investigations
- Incomplete drug titrations
- Future management plans
- Advice on secondary prevention [2007, amended 2013]

Offer a copy of the discharge summary to the patient. [2007]

Clinical Algorithm(s)

The following algorithms are provided in the full version of the original guideline document (see the "Availability of Companion Documents" field):

- Myocardial infarction
- Algorithm A - people who have had an MI
- Algorithm B - people who have had an MI who otherwise need anticoagulation

In addition, a NICE pathway on myocardial infarction: secondary prevention is available from the National Institute for Health and Care Excellence (NICE) Web site.

Scope

Disease/Condition(s)

Secondary cardiovascular events following acute myocardial infarction (MI)

Guideline Category

Counseling

Evaluation

Management

Prevention

Rehabilitation

Risk Assessment

Treatment

Clinical Specialty

Cardiology

Family Practice

Internal Medicine

Preventive Medicine

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Health Care Providers

Hospitals

Nurses

Patients

Physician Assistants

Physicians

Public Health Departments

Guideline Objective(s)

- To provide comprehensive advice to prevent further myocardial infarction (MI) and progression of vascular disease in those who had already had an MI, either recently or in the past (more than 12 months ago)
- To update the 2007 version of the guideline to include the most recent changes in the management of acute MI, both ST segment elevation MI (STEMI) and non-ST segment elevation MI (NSTEMI) and to update a recommendation from National Institute for Health and Care Excellence (NICE) technology appraisal guidance 80

Target Population

Adults aged 18 and older who have had a myocardial infarction (MI), either recently or in the past (more than 12 months ago)

Interventions and Practices Considered

1. Cardiac rehabilitation
    - Health education and information needs
    - Encouraging patients to attend
    - Exercise component

    - Psychological and social support
    - Sexual activity
2. Lifestyle changes
    - Changing diet (e.g., Mediterranean-style diet)
    - Physical activity for 20-30 minutes a day
    - Alcohol consumption
    - Smoking cessation
    - Weight management
3. Drug therapy
    - Angiotensin-converting enzyme (ACE) inhibitors
    - Dual antiplatelet therapy, including aspirin, clopidogrel, ticagrelor
    - Beta-blockers
    - Calcium channel blockers, as indicated
    - Aldosterone antagonists, as indicated
    - Statins
4. Left ventricular function assessment
5. Assessment for coronary revascularisation
6. Communication of diagnosis and advice

Major Outcomes Considered

- Mortality
- Revascularisation
- Reinfarction
- Stroke
- Adverse events, including bleeding complications
- Health-related quality of life
- Uptake and adherence to cardiac rehabilitation
- Cost-effectiveness

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance.

Developing the Review Questions and Outcomes

Review questions were developed in a PICO framework (population, intervention, comparison and outcome) for intervention reviews. This was to guide the literature searching process and to facilitate the development of recommendations by the guideline development group (GDG). They were drafted by the NCGC technical team and refined and validated by the GDG. The questions were based on the key clinical areas identified in the scope. See section 3.2 in the full version of the original guideline document for additional details on the review questions.

Searching for Evidence

Clinical Literature Search

Systematic literature searches were undertaken to identify evidence within published literature in order to answer the review questions as per The Guidelines Manual 2012 (see the "Availability of Companion Documents" field). Clinical databases were searched using relevant medical subject headings, free-text terms, and study type filters where appropriate. Studies published in languages other than English were not reviewed. Where possible, searches were restricted to articles published in the English language. All searches were conducted on core databases: MEDLINE, EMBASE, and The Cochrane Library. Additional subject specific databases were used for some questions: the Allied and Complementary Medicine Database (AMED) for the search on omega-3 fatty acids and oily fish consumption, PsycINFO for the search on barriers to the uptake of and adherence to cardiac rehabilitation, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) for the search on barriers to the uptake of and adherence to cardiac rehabilitation and interventions to increase uptake and adherence to cardiac rehabilitation. All searches were updated on 25th March 2013. No papers after this date were considered.

Search strategies were checked by looking at reference lists of relevant key papers, checking search strategies in other systematic reviews, and asking the GDG for known studies. The questions, the study types applied, the databases searched, and the years covered can be found in Appendix F in the full version of the original guideline document.

During the scoping stage, a search was conducted for guidelines and reports on the websites listed below and on organisations relevant to the topic. Searching for grey literature or unpublished literature was not undertaken. All references sent by stakeholders were considered.

- Guidelines International Network database (www.g-i-n.net)
- National Guideline Clearinghouse (www.guideline.gov/)
- NICE (www.nice.org.uk)
- National Institutes of Health Consensus Development Program (consensus.nih.gov/)
- National Library for Health (www.library.nhs.uk/)

Health Economic Literature Search

Systematic literature searches were also undertaken to identify health economic evidence within published literature relevant to the review questions. The evidence was identified by conducting a broad search relating to people who had a myocardial infarction in the National Health Service Economic Evaluation Database (NHS EED), the Health Economic Evaluations Database (HEED) and health technology assessment (HTA) databases with no date restrictions. Additionally, the search was run on MEDLINE and EMBASE, with a specific economic filter, from 2011, to ensure recent publications that had not yet been indexed by these databases were identified. Studies published in languages other than English were not reviewed. Where possible, searches were restricted to articles published in the English language.

The search strategies for health economics are included in Appendix F in the full version of the original guideline document. All searches were updated n 25th March 2013. No papers published after this date were considered.

Evidence of Effectiveness

The research fellow:

- Identified potentially relevant studies for each review question from the relevant search results by reviewing titles and abstracts – full papers were then obtained.
- Reviewed full papers against pre-specified inclusion/exclusion criteria to identify studies that addressed the review question in the appropriate population and reported on outcomes of interest (review protocols are included in Appendix C in the full version of the original guideline document.

Inclusion/Exclusion of Studies

See the review protocols in Appendix C in the full version of the original guideline document for full details.

The inclusion or exclusion of studies was based on the review protocols. The GDG were consulted about any uncertainty regarding inclusion/exclusion of selected studies.

See section 3.4.1 in the in the full version of the original guideline document for details on inclusion/exclusion of studies based on study population and study outcomes.

For the qualitative review, the GDG decided that only studies from the UK should be used since the participants' experience with cardiac

rehabilitation programs are likely to vary from country to country, as do costs, population demographics and access to care.

Only studies that used prescribed drugs licensed within the UK were included in the reviews.

Cohort studies were only included in the review if randomised controlled trials (RCTs) were not available. RCTs are less susceptible to selection bias because background factors (confounders) are mostly similar in the two treatment arms since participants are randomised to the groups. Also, unlike observational studies, randomised controlled trials rely less on people's recollection that can be misreported. There is also a chance in cohort studies that something fundamentally different between the groups may explain why they are receiving different treatments (i.e., different health status) or have different lifestyles (i.e., consume large quantities of fish).

Abstracts were only included if randomised controlled trials, cohort studies, or relevant qualitative papers were unavailable.

Evidence of Cost-Effectiveness

Evidence on cost-effectiveness related to the key clinical issues being addressed in the guideline was sought. The health economist:

- Undertook a systematic review of the economic literature
- Undertook new cost-effectiveness analysis in priority areas

Literature Review

The health economist:

- Identified potentially relevant studies for each review question from the economic search results by reviewing titles and abstracts – full papers were then obtained.
- Reviewed full papers against pre-specified inclusion/exclusion criteria to identify relevant studies.

Inclusion/Exclusion

Full economic evaluations (studies comparing costs and health consequences of alternative courses of action: cost–utility, cost-effectiveness, cost-benefit, and cost-consequence analyses) and comparative costing studies that addressed the review question in the relevant population were considered potentially applicable as economic evidence.

Studies that only reported cost per hospital (not per individual), or only reported average cost effectiveness without disaggregated costs and effects, were excluded. Abstracts, posters, reviews, letters/editorials, foreign language publications, and unpublished studies were excluded. Studies judged to have an applicability rating of 'not applicable' were excluded (this included studies that took the perspective of a non-Organisation for Economic Co-operation and Development country).

Remaining studies were prioritised for inclusion based on their relative applicability to the development of this guideline and the study limitations. For example, if a high quality, directly applicable UK analysis was available other less relevant studies may not have been included. Where exclusions occurred on this basis, this is noted in the relevant section.

For more details about the assessment of applicability and methodological quality see the economic evaluation checklist (The Guidelines Manual, Appendix C and the health economics research protocol in Appendix D).

When no relevant economic analysis was found from the economic literature review, relevant UK National Health Service unit costs related to the compared interventions were presented to the GDG to inform the possible economic implication of the recommendation to make.

Number of Source Documents

Refer to Appendices D (Clinical Article Selection) and E (Economic Article Selection) of the full guideline document (see the "Availability of Companion Documents" field) for study selection flowcharts.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Overall Quality of Outcome Evidence in Grading of Recommendations Assessment, Development and Evaluation (GRADE)

Level	Description
High	Further research is very unlikely to change confidence in the estimate of effect.
Moderate	Further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate.
Low	Further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate.
Very Low	Any estimate of effect is very uncertain.

Methods Used to Analyze the Evidence

Meta-Analysis

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance.

Evidence of Effectiveness

The research fellow:

- Critically appraised relevant studies using the appropriate checklist as specified in The Guidelines Manual (see the "Availability of Companion Documents" field).
- Extracted key information about the study's methods and results into evidence tables (evidence tables are included in Appendix G of the full guideline document).
- Generated summaries of the evidence by outcome (included in the relevant chapter write-ups of the full guideline document):
    - Randomised studies: meta analysed, where appropriate and reported in Grading of Recommendations Assessment, Development and Evaluation (GRADE) profiles (for clinical studies) – see below for details
    - Observational studies: data presented as a range of values in GRADE profiles
    - Qualitative studies: each study is summarised in a table and presented in a narrative. The quality of reporting for each study was summarised in the Evidence Table and in the Linking of Evidence to Recommendations in the full version of the original guideline document.

Methods of Combining Studies

Data Synthesis for Intervention Reviews

Where possible, meta-analyses were conducted to combine the results of studies for each review question using Cochrane Review Manager (RevMan5) software. Fixed-effects (Mantel-Haenszel) techniques were used to calculate risk ratios (relative risk) for the binary outcomes: all-cause mortality, cardiac death, sudden death, reinfarction, stroke, revascularisation, rehospitalisation, and adverse events. If there was heterogeneity random effects techniques were used. The continuous outcome of mean attendance to a cardiac rehabilitation programme was analysed using an inverse variance method for pooling weighted mean differences and where the studies had different scales or if only one study was available, standardised mean differences were used. The continuous outcome, quality of life, was not available for any of the reviews. Where reported, time-to-event data were presented as a hazard ratio.

Hazard ratios were presented in preference to relative risk for outcomes that were influenced by trial duration (i.e., all-cause mortality, reinfarction) regardless of the number of papers available for each calculation. The exceptions to this were: 1) when the quality of the hazard ratio data were

low or; 2) key papers that influence current medical practice were excluded from the analysis because they only provide relative risk data. In such instances relative risk was also presented.

The hazard ratio equals a weighted relative risk over the entire duration of a study and is derived from a time-to-event curve or Kaplan-Meier curve. This curve describes the status of both population groups at different time points after a defined starting point. Because some participants are often followed for a longer period of time than others (because they remained in the study while others dropped out), the time-to-event curve usually extends beyond the mean follow-up duration.

Hazard ratios were calculated wherever possible. To calculate hazard ratios, the log rank p value of the survival curves and the control and intervention event rates were needed. An Excel spread sheet with macros was used to calculate the log of the hazard ratio and its standard error. The generic inverse variance (GIV) method in Review Manager was then used to analyse the hazard ratio (HR) data. Alternatively, O-E and V data could be extracted from the spreadsheet and the O-E method could be used in RevMan. The O-E and V data refer to the observed minus the expected number of events and its variance (calculated from individual patient data). The number of events and total number of participants in the experimental and control groups can also be entered in RevMan which are needed for the calculation of absolute risk in GRADEpro.

Hazard ratios differ from relative risk ratios in that the latter are cumulative over an entire study, using a defined endpoint, while the former represent an instantaneous risk over the study time period. In contrast to relative risk, hazard ratios take into account the timing of events which may not be evenly distributed throughout the study period.

As the trial progresses, at some point prediction of treatment effect becomes very imprecise because there are few participants available to estimate the probability of the outcome of interest. Confidence intervals around the survival curves capture the precision of the estimate. Relative risk can be estimated by applying an average, weighted for the number of participants available, over the entire study duration. Such an estimate is the hazard ratio.

Statistical heterogeneity was assessed by considering the chi-squared test for significance at $p<0.1$ or an I-squared inconsistency statistic of >50% to indicate significant heterogeneity. The p value is taken as <0.1 instead of the standard <0.05 since the test for heterogeneity has low power. The number of studies is usually low and may fail to detect heterogeneity as statistically significant when it exists. To compensate for the low power of the test a higher significance level is taken, $P<0.1$, for statistical significance. Heterogeneity was also investigated if the forest plot showed inconsistency in the results but it was not detected by the chi-squared test. Where significant heterogeneity was present, predefined subgroup analyses were carried out on a selection of the following variables: timing of onset of the treatment, type of intervention, directness of the population, type of myocardial infarction, type of acute treatment, country the study was conducted in, comorbidity, age, ethnicity, type of stent, left ventricular systolic dysfunction, duration of treatment, indication for treatment. Details of these subgroups can be found in the review protocols. Sensitivity analysis based on the quality of studies was also carried out if there were differences, with particular attention paid to allocation concealment, blinding, and loss to follow-up (missing data). In cases where there was inadequate allocation concealment, unclear blinding, more than 20% missing data or differential missing data of 10% or higher than the event rate, this was examined in a sensitivity analysis. For the latter, the duration of follow-up was also taken into consideration prior to including in a sensitivity analysis.

Assessments of potential differences in effect between subgroups were based on the chi-squared tests for heterogeneity statistics between subgroups. If no sensitivity analysis was found to completely resolve statistical heterogeneity then a random effects (DerSimonian and Laird) model was employed to provide a more conservative estimate of the effect.

For binary outcomes, absolute event rates were calculated using the GRADEpro software using event rate in the control arm of the pooled results. These results are presented in the GRADE tables and in a summary of findings table for Guideline Development Group (GDG) discussion only.

Relative risks or hazard ratios, with their 95% confidence intervals, from multivariate analyses were extracted from the papers, and standard errors were calculated from the 95% confidence intervals. The log of the effect size with its standard error was entered into the generic inverse variance technique in the Cochrane Review Manager (RevMan5) software. Observational studies were not combined in a meta-analysis. Sensitivity analyses were carried out on the basis of study quality and results were presented from each individual paper. The means and standard deviations of continuous outcomes were required for meta-analysis.

Strata

For a number of reviews, the results were presented separately for pre-stratified groups or strata. See section 1.1.2.1 in the full guideline document for details.

Data Synthesis for Qualitative Studies

Factors associated with the uptake and adherence to cardiac rehabilitation programmes were extracted from qualitative papers (for example interviews, questionnaires) and summarised under the strata that were identified by the GDG as populations with low levels of participation. The

results were presented in a table and reported in a narrative in the guideline text. Data from qualitative studies were extracted until the point of saturation, that is, when no more additional findings were found. Studies using interviews and questionnaires were included because they are considered higher quality qualitative studies compared with case studies or observational studies because they provide more insight and provide data rich information.

Appraising the Quality of Evidence by Outcomes for Qualitative Studies

The criteria used to assess the studies' quality included the clarity of the aims; the rigor of the methodology; the clarity of the description of the role of the researcher; the clarity of the description of the context; the adequacy of the data analysis; the reliability of the analysis; the clarity of the findings; the relevance of the findings to the study aims and the appropriateness of the conclusions. The limitations of the studies were summarised in the extraction tables and comments were made in the "Linking Evidence to Recommendations" (LETRs) sections.

Appraising the Quality of Evidence by Outcomes for Randomised Controlled Trials (RCTs) and Observational Studies

The evidence for each outcome from the included RCT and observational studies were evaluated and presented using an adaptation of the "GRADE toolbox" developed by the international GRADE working group (http://www.gradeworkinggroup.org/). The software (GRADEpro) developed by the GRADE working group was used to assess the quality of each outcome, taking into account individual study quality and the meta-analysis results. The summary of findings was presented as two separate tables in the full guideline document. The "Clinical/Economic Study Characteristics" table includes details of the quality assessment while the "Clinical /Economic Summary of Findings" table includes pooled outcome data, where appropriate, an absolute measure of intervention effect and a summary statement grading the quality of evidence for that outcome. In this table, for continuous outcomes, the columns for intervention and control indicate the sample size, summed across the included studies. For binary outcomes such as number of participants with an adverse event, the event rates (n/N: sum of number of participants with events divided by sum of number of participants) are shown with percentages. Publication bias was only taken into consideration in the quality assessment and included in the Clinical Study Characteristics table if it was apparent.

Each binary outcome was examined separately for the quality elements listed and defined in Table 1 in the full guideline document and each graded using the quality levels listed in Table 2 in the full version of the original guideline document. The main criteria considered in the rating of these elements are discussed below. Footnotes were used to describe reasons for grading a quality element as having serious or very serious problems. The ratings for each component were summed to obtain an overall assessment for each outcome.

The GRADE toolbox is currently designed only for randomised trials and observational studies.

Grading the Quality of Clinical Evidence

After results were pooled, the overall quality of evidence for each outcome was considered. The following procedure was adopted when using GRADE:

1. A quality rating was assigned, based on the study design. RCTs start HIGH and observational studies as LOW, uncontrolled case series as LOW or VERY LOW.
2. The rating was then downgraded for the specified criteria: study limitations, inconsistency, indirectness, imprecision, and reporting bias. These criteria are detailed in section 3.4 in the full version of the original guideline document. Observational studies were upgraded if there was: a large magnitude of effect, a dose-response gradient, and if all plausible confounding would reduce a demonstrated effect or suggest a spurious effect when results showed no effect. Each quality element considered to have "serious" or "very serious" risk of bias were rated down 1 or 2 points respectively.
3. The downgraded/upgraded marks were then summed and the overall quality rating was revised. For example, all RCTs started as HIGH and the overall quality became MODERATE, LOW, or VERY LOW if 1, 2 or 3 points were deducted respectively.
4. The reasons or criteria used for downgrading were specified in the footnotes.

Grading the Quality of Qualitative Studies

A customised quality assessment was carried out on the qualitative studies. A narrative summary of the quality is provided in the Linking Evidence to Recommendation tables and in the Evidence Tables in the full guideline document. The assessment included how well the methods and population were reported, the richness of the data extracted from the participants (interviews are preferred to questionnaires), interpretation of the results by the authors, and relevance of the findings to the guideline.

Additional information related to factors that affect quality such as study limitations, inconsistency, indirectness, and imprecision are detailed in section 3.4 in the full version of the original guideline document.

Evidence Statements

Evidence statements were produced for each outcome indicating the quantity and quality of evidence available, and the outcome and population to which they relate.

Evidence of Cost-effectiveness

Literature Review

The health economist:

- Critically appraised relevant studies using the economic evaluations checklist as specified in The Guidelines Manual.
- Extracted key information about the study's methods and results into evidence tables (evidence tables are included in Appendix G in the full guideline document).
- Generated summaries of the evidence in NICE economic evidence profiles (included in the relevant chapter write-ups in the full guideline document).

NICE Economic Evidence Profiles

The NICE economic evidence profile has been used to summarise cost and cost-effectiveness estimates. The economic evidence profile shows, for each economic study, an assessment of applicability and methodological quality, with footnotes indicating the reasons for the assessment. These assessments were made by the health economist using the economic evaluation checklist from The Guidelines Manual. It also shows incremental costs, incremental outcomes (for example, quality adjusted life years [QALYs]), and the incremental cost-effectiveness ratio from the primary analysis, as well as information about the assessment of uncertainty in the analysis. See Table 6 in the full version of the original guideline document for more details. If a non-UK study was included in the profile, the results were converted into pounds sterling using the appropriate purchasing power parity.

Undertaking New Health Economic Analysis

As well as reviewing the published economic literature for each review question, as described above, new economic analysis was undertaken by the Health Economist in priority areas. Priority areas for new health economic analysis were agreed by the GDG after formation of the review questions and consideration of the available health economic evidence.

Additional data for the analysis were identified as required through additional literature searches undertaken by the Health Economist, and discussion with the GDG. Model structure, inputs, and assumptions were explained to and agreed by the GDG members during meetings, and they commented on subsequent revisions.

See Appendix L in the full version of the original guideline document for details of the health economic analysis undertaken for the guideline.

Methods Used to Formulate the Recommendations

Expert Consensus

Informal Consensus

Description of Methods Used to Formulate the Recommendations

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance.

A multidisciplinary Guideline Development Group (GDG) comprising professional group members and consumer representatives of the main stakeholders developed this guideline. The group met every 6 weeks during the development of the guideline.

Staff from the NCGC provided methodological support and guidance for the development process. The team working on the guideline included a project manager, systematic reviewers, health economists, and information scientists. They undertook systematic searches of the literature, appraised the evidence, conducted meta-analysis and cost effectiveness analysis where appropriate, and drafted the guideline in collaboration with the GDG.

Developing Recommendations

Over the course of the guideline development process, the GDG was presented with:

- Evidence tables of the clinical and economic evidence reviewed from the literature. All evidence tables are in Appendix G and Appendix H in the full guideline document.
- Summary of clinical and economic evidence and quality (as presented in chapters 5-7 in the full version of the original guideline document)
- Forest plots (Appendix I in the full version of the original guideline document)
- A description of the methods and results of the cost-effectiveness analysis undertaken for the guideline (Appendix L in the full version of the original guideline document)

Recommendations were drafted on the basis of the GDG interpretation of the available evidence, taking into account the balance of benefits, harms, and costs. The GDG decided whether the intervention was either beneficial, harmful, or had no effect based on the number of people who would benefit (or not) from the treatment compared with the number who had an event in the control group (adjusted for 1000 people). For all-cause mortality, cardiac mortality and sudden death, 5 more or less people per 1000 influenced by the treatment compared with the controls was considered effective. For reinfarction, stroke, revascularisation, rehospitalisation, 8 more or less participants influenced by the intervention compared with the controls was considered effective. For adverse events, a difference of at least 10 people compared with the control rate was considered effective. In addition to the number of people the intervention affected, the degree of imprecision was also taken into account when deciding if the intervention was clinically effective or not.

When clinical and economic evidence was of poor quality, conflicting or absent, the GDG drafted recommendations based on their expert opinion. The considerations for making consensus based recommendations include the balance between potential harms and benefits, economic costs or implications compared to the benefits, current practices, recommendations made in other relevant guidelines, patient preferences, and equality issues. The consensus recommendations were made through discussions in the GDG. The GDG also considered whether the uncertainty is sufficient to justify delaying making a recommendation to await further research, taking into account the potential harm of failing to make a clear recommendation (see Appendix N in the full version of the original guideline document).

The main considerations specific to each recommendation are outlined in the Linking Evidence to Recommendation Section in the full version of the original guideline document.

Rating Scheme for the Strength of the Recommendations

Strength of Recommendations

Some recommendations can be made with more certainty than others. The Guideline Development Group (GDG) makes a recommendation based on the trade-off between the benefits and harms of an intervention, taking into account the quality of the underpinning evidence. For some interventions, the GDG is confident that, given the information it has looked at, most patients would choose the intervention. The wording used in the recommendations in this guideline denotes the certainty with which the recommendation is made (the strength of the recommendation).

Interventions That Must (or Must Not) Be Used

The GDG usually uses 'must' or 'must not' only if there is a legal duty to apply the recommendation. Occasionally 'must' (or 'must not') is used if the consequences of not following the recommendation could be extremely serious or potentially life threatening.

Interventions That Should (or Should Not) Be Used – a 'Strong' Recommendation

The GDG uses 'offer' (and similar words such as 'refer' or 'advise') when confident that, for the vast majority of patients, an intervention will do more good than harm, and be cost-effective. Similar forms of words (for example, 'Do not offer…') are used when the GDG is confident that an intervention will not be of benefit for most patients.

Interventions That Could Be Used

The GDG uses 'consider' when confident that an intervention will do more good than harm for most patients, and be cost-effective, but other options may be similarly cost-effective. The choice of intervention, and whether or not to have the intervention at all, is more likely to depend on the patient's values and preferences than for a strong recommendation, and so the healthcare professional should spend more time considering and discussing the options with the patient.

Cost Analysis

Cost-Effectiveness Criteria

In general, an intervention was considered to be cost effective if either of the following criteria applied (given that the estimate was considered plausible):

a. The intervention dominated other relevant strategies (that is, it was both less costly in terms of resource use and more clinically effective compared with all the other relevant alternative strategies), or
b. The intervention cost less than £20,000 per quality adjusted life year (QALY) gained compared with the next best strategy.

If the GDG recommended an intervention that was estimated to cost more than £20,000 per QALY gained, or did not recommend one that was estimated to cost less than £20,000 per QALY gained, the reasons for this decision are discussed explicitly in the 'from evidence to recommendations' section of the relevant chapter in the full guideline document with reference to issues regarding the plausibility of the estimate or to the factors set out in the 'Social value judgements: principles for the development of NICE guidance'.

If a study reported the cost per life year gained but not QALYs, the cost per QALY gained was estimated by multiplying by an appropriate utility estimate to aid interpretation. The estimated cost per QALY gained is reported in the economic evidence profile with a footnote detailing the life-years gained and the utility value used. When QALYs or life years gained are not used in the analysis, results are difficult to interpret unless one strategy dominates the others with respect to every relevant health outcome and cost.

Relevant health economic evidence for recommendations can be found in the specific chapters in the full version of the original guideline document (see the "Availability of Companion Documents" field).

Additional information regarding health economics is provided in Appendices L and M in the full version of the original guideline document.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

The guideline was validated through two consultations.

1. The first draft of the guideline (the full guideline, National Institute for Health and Care Excellence [NICE] guideline, and Quick Reference Guide) were consulted with stakeholders and comments were considered by the Guideline Development Group (GDG).
2. The final consultation draft of the full guideline, the NICE guideline and the Information for the Public were submitted to stakeholders for final comments.

The final draft was submitted to the Guideline Review Panel for review prior to publication.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of evidence supporting the recommendations is not specifically stated.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate secondary prevention in primary and secondary care for patients following a myocardial infarction (MI) which may prevent further MI and progression of vascular disease

See the "Trade-off between clinical benefits and harms" sections in the full guideline document for additional details about benefits of specific interventions.

Potential Harms

Adverse effects associated with treatment

See the "Trade-off between clinical benefits and harms" sections in the full guideline document for details about harms of specific interventions.

Contraindications

Contraindications

- A narrative review that was not evidence based, stated that the following conditions are absolute contraindications to exercise training:
  - Unstable angina pectoris
  - Dangerous arrhythmias
  - Overt cardiac failure
  - Severe obstruction of the left ventricular outflow tract
  - Dissecting aneurysm
  - Myocarditis or pericarditis (acute)
  - Recent systemic or pulmonary embolism
  - Thrombophlebitis
  - Serious systemic disease
  - Severe hypertension
  - Overt psychoneurotic disorders
  - Uncontrolled diabetes mellitus
  - Severe orthopaedic limitations
- The American Heart Association has the following recommendation that is not evidence-based: Exercise training is contraindicated in patients with the following clinical indications:
  - Unstable angina
  - Severe and symptomatic valvular stenosis or regurgitation
  - Symptoms of heart failure, especially New York Heart Association (NYHA) Class IV
  - Arrhythmias refractory to therapy
  - Other clinical entities that worsen during exercise
- Phosphodiesterase type inhibitors must be avoided in patients treated with nitrates and/or nicorandil because this can lead to dangerously low blood pressure.
- For patients with heart failure, verapamil, diltiazem and short-acting dihydropyridine agents should be avoided.
- Angiotensin-converting enzyme (ACE) inhibitors should be avoided in patients with known renal artery stenosis.

Qualifying Statements

Qualifying Statements

- This guidance represents the view of the National Institute for Health and Care Excellence (NICE), which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer, and informed by the summaries of product characteristics of any drugs.
- Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to have due regard to the need to eliminate

unlawful discrimination, advance equality of opportunity and foster good relations. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.

- The guideline will assume that prescribers will use a drug's summary of product characteristics to inform decisions made with individual patients.
- Treatment and care should take into account individual needs and preferences. Patients should have the opportunity to make informed decisions about their care and treatment, in partnership with their healthcare professionals. Healthcare professionals should follow the Department of Health's advice on consent (or, in Wales, advice on consent from the Welsh Government). If someone does not have capacity to make decisions, healthcare professionals should follow the code of practice that accompanies the Mental Capacity Act and the supplementary code of practice on deprivation of liberty safeguards .
- NICE has produced guidance on the components of good patient experience in adult National Health Service services. All healthcare professionals should follow the recommendations in Patient experience in adult NHS services .
- For all recommendations, NICE expects that there is discussion with the patient about the risks and benefits of the interventions, and their values and preferences. This discussion aims to help them to reach a fully informed decision.

Implementation of the Guideline

Description of Implementation Strategy

The National Institute for Health and Care Excellence (NICE) has developed tools to help organisations implement this guidance. These are available on the NICE Web site (see also the "Availability of Companion Documents" field).

Key Priorities for Implementation

The following recommendations have been identified as priorities for implementation.

Cardiac Rehabilitation after an Acute Myocardial Infarction (MI)

- Offer cardiac rehabilitation programmes designed to motivate people to attend and complete the programme. Explain the benefits of attending. [new 2013]
- Begin cardiac rehabilitation as soon as possible after admission and before discharge from hospital. Invite the person to a cardiac rehabilitation session which should start within 10 days of their discharge from hospital. [new 2013]

Lifestyle Changes after an MI

- Advise people to eat a Mediterranean-style diet (more bread, fruit, vegetables, and fish; less meat; and replace butter and cheese with products based on plant oils). [2007]
- Advise people to be physically active for 20 to 30 minutes a day to the point of slight breathlessness. Advise people who are not active to this level to increase their activity in a gradual, step-by-step way, aiming to increase their exercise capacity. They should start at a level that is comfortable, and increase the duration and intensity of activity as they gain fitness. [2007]
- Advise all people who smoke to stop and offer assistance from a smoking cessation service in line with the NICE guideline Brief interventions and referral for smoking cessation (NICE public health guidance 1). [2007]

Drug Therapy

- Offer all people who have had an acute MI treatment with the following drugs:
  - Angiotensin-converting enzyme (ACE) inhibitor
  - Dual antiplatelet therapy (aspirin plus a second antiplatelet agent)
  - Beta-blocker
  - Statin [2007, amended 2013]
- Offer an assessment of left ventricular function to all people who have had an MI. [2013]
- Titrate the ACE inhibitor dose upwards at short intervals (for example, every 12 to 24 hours) before the person leaves hospital until the maximum tolerated or target dose is reached. If it is not possible to complete the titration during this time, it should be completed within 4 to 6 weeks of hospital discharge. [new 2013]
- Communicate plans for titrating beta-blockers up to the maximum tolerated or target dose – for example, in the discharge summary. [new

2013]

Communication of Diagnosis and Advice

- After an acute MI, ensure that the following are part of every discharge summary:
  - Confirmation of the diagnosis of acute MI
  - Results of investigations
  - Incomplete drug titrations
  - future management plans
  - Advice on secondary prevention [2007, amended 2013]

Implementation Tools

Audit Criteria/Indicators

Clinical Algorithm

Mobile Device Resources

Patient Resources

Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Living with Illness

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

National Clinical Guideline Centre. MI â€“ secondary prevention. Secondary prevention in primary and secondary care for patients following a myocardial infarction. London (UK): National Institute for Health and Care Excellence (NICE); 2013 Nov. 40 p. (Clinical guideline; no. 172).

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2007 May (revised 2013 Nov)

Guideline Developer(s)

National Guideline Centre - National Government Agency [Non-U.S.]

Source(s) of Funding

National Institute for Health and Care Excellence (NICE)

Guideline Committee

Guideline Development Group

Composition of Group That Authored the Guideline

Guideline Development Group Members: Philip Adams, Emeritus Consultant Cardiologist, The Newcastle Hospitals NHS Foundation Trust; Ivan Bennet, GP with an interest in cardiology and Clinical Director, Central Manchester Clinical Commissioning Board; Kathryn Carver, Cardiac Rehabilitation Lead Nurse, Cambridge University Hospitals NHS Foundation Trust; William Cunningham, GP, Northumberland; Jennifer Jones, Director of Prevention, Training and Education, Croi Cardiac Foundation, National University of Ireland, Galway; Caroline Levie, Practitioner with a special interest in cardiology, County Durham and Darlington NHS Trust; Joseph Mills (until July 2012), Consultant Cardiologist and Interventional Cardiologist, Liverpool Heart and Chest Hospital NHS Foundation Trust; Jerry Murphy, Professor of Cardiovascular Medicine, University of Durham; Sanjay Ramdany, Community Matron with a special interest in CHD, Isle of Wight NHS Trust and Visiting Lecturer, University of Southampton; Linda Speck, Consultant Clinical Health Psychologist, Abertawe Bro Morgannwg University Health Board, Wales and Visiting Professor of Health Psychology, University of South Wales; John Walsh, Patient member; Maria Wray, Patient member; Paul Wright, Principle Cardiac Pharmacist, Barts Health NHS Trust; Robert Wright (from September 2012), Consultant Cardiologist with a special interest in interventional cardiology, South Tees Hospitals, NHS Foundation Trust

Co-opted expert: Ms Jo Farrington, Public health specialist and cardiovascular dietitian, Oldham PCT

Financial Disclosures/Conflicts of Interest

At the start of the guideline development process all Guideline Development Group members declared interests including consultancies, fee-paid work, share-holdings, fellowships and support from the healthcare industry. At all subsequent Guideline Development Group meetings, members declared arising conflicts of interest, which were also recorded (see Appendix B in the full guideline document [see the "Availability of Companion Documents" field]).

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: National Collaborating Centre for Primary Care. Post myocardial infarction: secondary prevention in primary and secondary care for patients following a myocardial infarction. London (UK): Royal College of General Practitioners; 2007 May. 231 p.

Guideline Availability

Electronic copies: Available from the National Institute for Health and Care Excellence (NICE) Web site .

Availability of Companion Documents

The following are available:

- MI - secondary prevention. Secondary prevention in primary and secondary care for patients following a myocardial infarction. Full guideline. London (UK): National Institute for Health and Care Excellence (NICE); 2013 Nov. 604 p. (Clinical guideline; no. 172). Electronic copies: Available in Portable Document Format (PDF) from the National Institute for Health and Care Excellence (NICE) Web site.
- MI - secondary prevention. Secondary prevention in primary and secondary care for patients following a myocardial infarction. Appendices. London (UK): National Institute for Health and Care Excellence (NICE); 2013 Nov. Various p. (Clinical guideline; no. 172). Electronic copies: Available in PDF from the NICE Web site.
- MI - secondary prevention. Secondary prevention in primary and secondary care for patients following a myocardial infarction. Baseline assessment tool. London (UK): National Institute for Health and Care Excellence (NICE); 2013 Nov. (Clinical guideline; no. 172). Electronic copies: Available from the NICE Web site.
- MI - secondary prevention. Secondary prevention in primary and secondary care for patients following a myocardial infarction. Clinical audit tool. London (UK): National Institute for Health and Care Excellence (NICE); 2013 Nov. (Clinical guideline; no. 172). Electronic copies: Available from the NICE Web site.
- MI - secondary prevention. Secondary prevention in primary and secondary care for patients following a myocardial infarction. Costing statement. London (UK): National Institute for Health and Care Excellence; 2013 Nov. 7 p. (Clinical guideline; no. 172). Electronic copies: Available in PDF from the NICE Web site.
- Myocardial infarction: secondary prevention overview. NICE pathway. London (UK): National Institute for Health and Care Excellence (NICE); 2012 Nov. (Clinical guideline; no. 172). Electronic copies: Available from the NICE Web site.
- The guidelines manual 2012. London (UK): National Institute for Health and Care Excellence (NICE); 2012 Nov. Electronic copies: Available from the NICE Archive Web site.

Patient Resources

The following is available:

- Preventing another heart attack. Information for the public. London (UK): National Institute for Health and Care Excellence (NICE); 2013 Nov. (Clinical guideline; No. 172). Electronic copies: Available from the National Institute for Health and Care Excellence (NICE) Web site. Also available for download as a Kindle or EPUB ebook from the NICE Web site.

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC Status

This summary was completed by ECRI Institute on August 5, 2009. This summary was updated by ECRI Institute on January 4, 2010 following the U.S. Food and Drug Administration advisory on Plavix (Clopidogrel). This summary was updated by ECRI Institute on May 17, 2010 following the U.S. Food and Drug Administration advisory on Plavix (clopidogrel). This summary was updated by ECRI Institute on July 26, 2010 following the U.S. Food and Drug Administration (FDA) advisory on Proton Pump Inhibitors (PPI). This summary was updated by ECRI Institute on June 27, 2011 following the U.S. Food and Drug Administration advisory on Zocor (simvastatin). This summary was updated by ECRI Institute on April 13, 2012 following the U.S. Food and Drug Administration advisories on Statin Drugs and Statins and HIV or Hepatitis C drugs. This NGC summary was updated by ECRI Institute on April 16, 2014.

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